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# PROSPECTS OF PRECISION FARMING IN FRUIT CROPS IN INDIA

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***ABSTRACT***

***Precision farming is a new promising technology through which exact or accurate results of farming can be obtained. It involves the application of modern tools of information and space technology for increasing productivity through judicious use of resources like land, water, sunlight energy as well as time. Computers, Global Position System (GPS), Geographic Information System (GIS), sensors and application control are the five major categories of technology which enable the precision farming to operate. But these technologies are still restricted to developed countries like America and Europe. Precision farming in Indian context is still in its infancy. Limitations are there to adopt precision farming as a package. But there are numerous opportunities for adopting few aspects of precision farming. Many fruit crops in India, which are high profit making offer wide scope for precision farming. Here we discuss prospects of precision farming in fruit crops in India.***

***KEYWORDS: Precision Farming, Fruit Crops, India***

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## INTRODUCTION

Precision farming refers to the management of spatial and temporal variability using technologies and principles related with agricultural production for improving crop productivity and environmental qualities. Briefly we can define precision farming as the technology through which right amount of treatment is given at the right time and the right location within a field. Thrust is given to site specific information to precisely manage production inputs. Precision farming is being practiced in developed countries. But in Indian context it is still in its infancy. India is the second largest producer of fruits in the world. So it is one of the best options for improving land, generating employment, improving economic condition of farmers and the nutritional security by adopting few aspects of precision farming in fruit crop cultivation.

## PRECISION FARMING TOOLS

### Remote Sensing

It refers to the science of gathering information regarding the Earth's surface with no contact with it. Reflected or emitted energy is recorded, processed, analyzed and finally that information or data is applied.

### Geographic Information System (GIS)

It is a system designed for computation, storage, interpretation and presentation of geographical data with

the help of computer.

**Global Positioning System (GPS)**

It is very important to locate particular site in field in need of specific inputs. So that exact quantity of inputs can be applied after assessing the spatial variability.

**Variable Rate Technology (VRT)**

**Since there exists spatial variability in field, precise amount of inputs should be applied in specific location. VRT consists a farm field equipment which enable the precise application of crop inputs.**

**Yield Monitoring**

It is done with the help of devic es installed in harvesting equipment.

**Yield Mapping**

Crop management plan for the coming season can be made with the help of yield mapping and correlation of that map with spatial and temporal variability of various parameters (Nath *et al*., 2013).

**APPLICATIONS OF PRECISION FARMING**

Precision farming as package has received little attention at farmer's field level. In present context we can try some of its applications.

**Water Management**

Drip irrigation is described as a method which saves water and fertilizer through regulated or slow application of irrigation water. A network of valves, pipes, emitters etc support the system. It allows water to drip slowly at frequent interval near the root zone plant. Fifty to seventy percentage of water is saved by this method of irrigation. Labour and energy cost can be reduced. Negligible weed infestation is reported. Success reports of drip irrigation recommendation for plantain and banana were reported by Goenaga *et al*. (1995) in semi arid southern coast of Puerto Rico. In sprinkler irrigation system, water is sprayed into the air and allow to fall on the ground surface somewhat resembling to rainfall. The spray is created by the flow of water pressure through small nozzles. It is practiced in guava. Fertigation enables to achieve precise application of both water and nutrients at a time in irrigated horticultural production systems (Bar- Yosef, 1999). Deciduous fruit trees are having low rooting density , several orders of degree lower than that of herbaceous plants (Atkinson, 1980), and low density root systems were also found in apple trees on dwarfing root stocks (Neilsen *et al*. 1997). So fertigation can be recommended in such crops. Schumann *et al.* (2003) stated two years data on the reaction of seven and eight year old Hamlin orange trees on 'Swingle' citrumelo rootstock grown (286 trees/ha) on a candler fine sand in central Florida. The peak fruit yield of trees under fertigation was greater compared with trees under dry granular fertilizer treatment. The fertigation practices has been standardized in Kinnow mandarin and results revealed that 70 and 40% of recommended dose of nitrogen and phosphorus during February–June, 20, 50 and 40% of recommended dose of nitrogen, phosphorus and potash during July–September and remaining 10% of N and P and 60% of potash during October–December may be applied through microirrigation (drip and micro-sprinkler) for optimum productivity with maximum water and nutrient-use efficiency (DARE/ ICAR Annual report, 2007).

**Surface Covered Cultivation**

Mulching is one of the beneficial practices used to reduce or increase the temperature, suppress weed growth, conserve soil moisture and improve soil conditions. Plastic and stable hay mulches can be used in newly planted avocado, mango, and papaya orchards. Drip irrigation, and sprinkler irrigation were installed with the plastic mulch and the stable hay, respectively. Excellent tree growth and minimum weed infestation were noticed with the plastic mulch (Balerdi, 1976). In passion fruit fertigation with 75 and 100% of recommended dose of fertilizer recorded higher yield as compared to soil application of fertilizer. This indicates a saving of 25% of water and fertilizer. During April–June 28–45% more moisture was conserved under black polythene mulch in aonla. (DARE/ ICAR Annual report, 2007). Soil solarization is an environment friendly method of healing the soil by covering it with transparent polythene sheets during hot periods to control soil born pathogens and pests. It also kills weed seeds and seedlings. Studies conducted by Khanzada *et al*. (2009) reported that soil solarization by polyethylene mulching practiced in mango orchards in order to reduce the primary inoculums of soil-borne casual pathogen (*L. theobromae*) especially in the nursery beds and pits in orchards before transplanting was very effective.

**Controlled Environmental Condition**

It consists of green house, polyhouse, tunnels etc. These are a framed structure covered with a transparent material which give protection to crop and create environment for growing in offseason. Certain crops like grape, pomegranate, peaches, strawberry and lime etc. can be taken up in the areas where monsoons are limiting factor. Package of practices for growing of different crops under greenhouse is required to be standardized. When strawberry cultivated in green house condition, resulted in high yield per unit area, good fruit quality, early production when market prices are high and comparatively easier pest management with minium use of chemicals (Dinar, 2003). Protected cultivation for early table grape production was promising for the Eastern Mediterranean region and more economical than open field growing (Kamiloglu, 2011).

**High Density Planting**

It is a system of planting more number of plants than optimum through manipulation of tree size. Dwarf plants are produced using genetically dwarf scion cultivars, dwarfing rootstock and interstock, training and pruning and use of growth retardants. High planting density is widely adopted in mango orchards at global level to increase earliness, to improve handling and cultural practices, and to minimise costs (Nath *et al*., 2007).

**Meadow Orcharding**

It is also called as ultra high density planting system. Literally it can be considered as grass land. In order to keep up tree form, severe top pruning is done like mowing of grassland. Meadow Orchard System is a new concept of guava planting which has been developed for the first time in India at Central Institute for Subtropical Horticulture, Lucknow. Plant spacing is 2.0 m x 1.0 m, which gives a density of 5000 plants per hectare. Average production is 10-12 kg fruits per plant every year. There is no damage to fruits as the harvesting is easy in meadow orchard. Seven guava varieties, viz. Allahabad Safeda, Sardar, Shweta, Lalit, CISH-G-5, CISH-G-6 and hybrid (Lalit x Shweta) evaluated under meadow orchard system showed positive impact of the technology (Singh, 2008).

**Micro Propagation**

It refers to the production of plant from very small plant parts, tissues or cells, grown aseptically in a test tube or containers under controlled environment. Fruit crops like banana, pomegranate, datepalm, pineapple, strawberry, watermelon, citrus, fig, sapota etc can be propagated through this technique.

Organic farming, Integrated pest management and Integrated nutrient managements are also some of its applications. The plants are monitored constantly, particularly for pests and insects. Pesticides and insecticides are used based on the actual need. Awareness programmes can be conducted for farmers about consequences of application of imbalanced doses of fertilizers, insecticides, fungicides, herbicides etc.

**PROSPECTS**

Precision farming in many developing countries as well as in India is in its infancy. But there exists many opportunities for taking up this new generation farming method. One of the major problems is fragmentation of land. However many horticultural crops in India, which are high profit making crops, offer wide scope. Proper guidance from public, privates sectors and agricultural associations are needed for Indian progressive famers to adopt these innovative technologies, especially in the initial stages. They should identify the element of precision farming which is relevant in that farm. It is not possible to adopt all elements in the present scenario of Indian context. Not all farmers are suitable to implement precision farming. Some growers are adopting partially by following certain elements but not others. Farmers should be convinced that it also brings more or similar profit as conventional practice; of course it has environmental benefits. More emphasis should be given for productivity to encourage farmers. Culture and perceptions of the users, small farm size, lack of success stories, heterogeneity of cropping systems and market imperfections, lack of local technical expertise and high cost of obtaining site specific data are the major constraints existing. Scientists, researchers, farmers and government should come forward with steps to be taken for implementing precision farming. A multidisciplinary team should be formed to study the scope of precision farming in India.

There are 17 Precision Farming Development Centers (PFDC) in India. They will play an important role in the development of regionally differentiated technology validation and dissemination. These centers should be equipped with essential hardware and software needed for generating information on precision farming techniques in the farm. PFDC Solan has come up with specific recommendations for drip irrigation and plasticulture in peach, apricot, plum and pea; fertigation in apricot and anti hail nets for peach, apricot and plum. They made 24 recommendations in crop geometry, plastic mulching, micro-irrigation, protected cultivation and anti-hail nets for commercially important fruits, vegetables and flower crops.

## CONCLUSIONS

In India, precision farming is in its infancy. The main reasons are high cost of technology and high level of fragmentation of farm holdings. However, by following the basic principles of precision farming, Indian farmers can have better yield than through conventional methods. Resource consumption, input, labour cost etc can be lowered and farmers can enjoy a better profit. A package should be developed for fruit crops like banana, mango, strawberry, sapota, citrus, pomegranate, papaya ,apple, plum, peach, pear, apricot etc based on knowledge on soil environment and crop needs to enhance the efficiency of inputs in given time frame. Since many of the precision agriculture tools are costly (GIS, GPS, RS, etc.), farmer's co-operatives can be formed. Effective coordination among public, private sectors and growers is,

therefore, essential for implementing new strategies to accomplish fruitful success.

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